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Claims

[c1] 1.A method of locating systematic defects in integrated circuits, said method comprising:

performing preliminary extracting and index processing of a circuit design comprising:

transforming shapes in a circuit layout into feature vectors; and

comparing said feature vectors to produce an index of feature vectors; and

after performing said extracting and index processing, performing a process of feature searching comprising:

identifying a defect region of said circuit layout;

transforming shapes in said defect region into defect vectors; and

finding feature vectors that are similar to said defect vector using said index of feature vectors.

[c2] 2.The method in claim 1, further comprising analyzing similarities and differences between manufactured shapes represented by said defect vectors and manufactured shapes represented by said feature vectors that are similar to said defect vectors.

[c3] 3.The method in claim 1, further comprising, after said comparing process, storing said feature vectors and said index in a database, wherein said database is used for multiple different features searching processes.

[c4] 4.The method in claim 1, further comprising, before said comparing process, performing sampling on said feature vectors to eliminate redundant feature vectors.

[c5] 5.The method in claim 1, further comprising maintaining coordinate location information of said feature vectors within said circuit design.

[c6] 6.The method in claim 1, wherein said extracting and index processing is performed for a first window size and, wherein said method further comprises repeating said extracting and index processing for different window sizes.

[c7] 7.The method in claim 6, wherein said process of finding feature vectors comprises using feature vectors that have a window size matching a window size of said defect region.

[c8] 8.A method of locating systematic defects in integrated circuits, said method comprising:

performing preliminary extracting and index pro-

cessing of a circuit design comprising:

transforming shapes in a circuit layout into feature vectors by finding intersections between basis patterns and said shapes in said circuit layout; and

comparing said feature vectors to produce an index of feature vectors; and

after performing said extracting and index processing, performing a process of feature searching comprising:

identifying a defect region of said circuit layout;

transforming shapes in said defect region into defect vectors by finding intersections between basis patterns and said shapes and said defect region; and

finding feature vectors that are similar to said defect vector using said index of feature vectors.

[c9] 9.The method in claim 8, further comprising analyzing similarities and differences between said defect vectors and said feature vectors that are similar to said defect vectors.

[c10] 10.The method in claim 8, further comprising, after said comparing process, storing said feature vectors and said index in a database, wherein said database is used for multiple different features searching processes.

[c11] 11.The method in claim 8, further comprising, before

said comparing process, performing sampling on said feature vectors to eliminate redundant feature vectors.

[c12] 12.The method in claim 8, further comprising maintaining coordinate location information of said feature vectors within said circuit design.

[c13] 13.The method in claim 8, wherein said extracting and index processing is performed for a first window size and, wherein said method further comprises repeating said extracting and index processing for different window sizes.

[c14] 14.The method in claim 13, wherein said process of finding feature vectors comprises using feature vectors that have a window size matching a window size of said defect region.

[c15] 15.A method of locating systematic defects in integrated circuits, said method comprising:

performing preliminary extracting and index processing of a circuit design comprising:

establishing a window grid for said circuit design;

merging basis patterns with shapes in said circuit design within each window of said window grid;

transforming shapes in a each window into feature vectors by finding intersections between said basis

patterns and said shapes in said windows; and
comparing said feature vectors to produce an index of feature vectors; and
after performing said extracting and index processing, performing a process of feature searching comprising:
identifying a defect region window of said circuit layout;
merging basis patterns with shapes in said defect region window;
transforming shapes in said defect region window into defect vectors by finding intersections between basis patterns and said shapes in said defect region; and
finding feature vectors that are similar to said defect vector using said index of feature vectors.

[c16] 16.The method in claim 15, further comprising analyzing similarities and differences between said defect vectors and said feature vectors that are similar to said defect vectors.

[c17] 17.The method in claim 15, further comprising, after said comparing process, storing said feature vectors and said index in a database, wherein said database is used for multiple different features searching processes.

[c18] 18.The method in claim 15, further comprising, before said comparing process, performing sampling on said feature vectors to eliminate redundant feature vectors.

[c19] 19.The method in claim 15, further comprising maintaining coordinate location information of said feature vectors within said circuit design.

[c20] 20.The method in claim 15, wherein said extracting and index processing is performed for a first window size and, wherein said method further comprises repeating said extracting and index processing for different window sizes.

[c21] 21.The method in claim 20, wherein said process of finding feature vectors comprises using feature vectors that have a window size matching a window size of said defect region.

[c22] 22.A method of locating systematic defects in integrated circuits, said method comprising:

performing preliminary extracting and index processing of a circuit design comprising:

establishing a window grid for said circuit design;

merging basis patterns with shapes in said circuit design within each window of said window grid;

transforming shapes in a each window into feature

vectors by finding intersections between said basis patterns and said shapes in said windows; and

comparing said feature vectors to produce an index of feature vectors; and

after performing said extracting and index processing, performing a process of feature searching comprising:

identifying a defect region window of said circuit layout;

merging basis patterns with shapes in said defect region window, wherein said merging process includes rotating and mirroring said shapes in said defect region;

transforming shapes in said defect region window into defect vectors by finding intersections between basis patterns and said shapes in said defect region; and

finding feature vectors that are similar to said defect vector using representative feature vectors from said index of feature vectors.

[c23] 23.The method in claim 22, further comprising analyzing similarities and differences between said defect vectors and said feature vectors that are similar to said defect vectors.

[c24] 24.The method in claim 22, further comprising, after said comparing process, storing said feature vectors and said index in a database, wherein said database is used for multiple different features searching processes.

[c25] 25.The method in claim 22, further comprising, before said comparing process, performing sampling on said feature vectors to eliminate redundant feature vectors.

[c26] 26.The method in claim 22, further comprising maintaining coordinate location information of said feature vectors within said circuit design.

[c27] 27.The method in claim 22, wherein said extracting and index processing is performed for a first window size and, wherein said method further comprises repeating said extracting and index processing for different window sizes.

[c28] 28.The method in claim 27, wherein said process of finding feature vectors comprises using feature vectors that have a window size matching a window size of said defect region.

[c29] 29.A program storage device readable by machine, tangibly embodying a program of instructions executable by the machine to perform a method of locating systematic defects in integrated circuits, said method comprising:

performing preliminary extracting and index processing of a circuit design comprising:

transforming shapes in a circuit layout into feature vectors; and

comparing said feature vectors to produce an index of feature vectors; and

after performing said extracting and index processing, performing a process of feature searching comprising:

identifying a defect region of said circuit layout;

transforming shapes in said defect region into defect vectors; and

finding feature vectors that are similar to said defect vector using said index of feature vectors.

[c30] 30.The program storage device in claim 29, wherein said method further comprises analyzing similarities and differences between manufactured shapes represented by said defect vectors and manufactured shapes represented by said feature vectors that are similar to said defect vectors.

[c31] 31.The program storage device in claim 29, wherein said method further comprises, after said comparing process, storing said feature vectors and said index in a database, wherein said database is used for multiple different features searching processes.

[c32] 32.The program storage device in claim 29, wherein said method further comprises, before said comparing process, performing sampling on said feature vectors to eliminate redundant feature vectors.

[c33] 33.The program storage device in claim 29, wherein said method further comprises maintaining coordinate location information of said feature vectors within said circuit design.

[c34] 34.The program storage device in claim 29, wherein said extracting and index processing is performed for a first window size and, wherein said program storage device further comprises repeating said extracting and index processing for different window sizes.

[c35] 35.The program storage device in claim 34, wherein said process of finding feature vectors comprises using feature vectors that have a window size matching a window size of said defect region.